The exhibition of physical apparatus at Paris comprised numerous ingenious instruments, but there was no attempt at arranging educational sets. Lord Kelvin's voltmeters and ammeters were shown, and various instruments for measuring electric energy and resistance. A binocular photometer attracted some attention, and also a new kind of ophthalometer and a monochromatoscope. M. V. Chabaud showed a form of electrometer devised by M. Lippmann, several pieces of apparatus made from dielectrine, tolueine thermometers for the measurement of low temperatures, Villard manometers, Varenne's apparatus for fractional distillation, and Bichat's hygrometers. M. J. Carpentier's exhibit included mica condensors, and an instrument invented by General Sebert for determining the rapidity of photographic plates. M. J. Richard showed a meteorograph constructed for the observatory on Mont Blanc, an electric anemometer, Favé sounding-line, and numerous recording voltmeters and ammeters. His exhibit also comprised, among other things, several of Bonetti's electrical machines, Berlemont's mercury pump, and various sterilisers. The photographs of interference fringes obtained by M. Meslin call for special mention, and also a pendulum devised by Captain Colson for measuring short exposures in photography, and a theodolite adapted to photographic work by M. Echassoux. The French Photographic Society exhibited sets of photographic apparatus, and M. G. Raymond some fine cloud photographs. The apparatus used by M. Marey for photographing objects in motion, naturally found a place in the exhibition. Photographs in colours, obtained by the Lippmann method, were seen by projection, and were greatly admired. Many other results of scientific research were shown, together with the instruments by means of which they were obtained, but no useful purpose would be served by enumerating them. It is proposed to hold a similar exhibition next year, and if instrument-makers co-operate with investigators as they did in the one just closed, there can be no doubt as to its value to workers in all branches of physics.

There should be little difficulty in arranging an annual exhibition of a similar kind in London. Scientific instrument-makers would compete with one another in showing work of a high quality; and if the exhibits were organised by a competent committee, the venture would be successful from every point of view. R. A. G.

AUGUST KUNDT.

PHYSICAL science, which within the lapse of six years has witnessed the death of Kirchhoff, Clausius, and Hertz, has suffered another severe loss; on May 21, August Kundt, who was but fifty-four years of age, suddenly died at his country place near Lübeck.

Kundt was born at Schwerin, on November 18, 1839, and began his studies at Leipzig in 1860, under Hankel, Neumann, Bruhns, and others. Thence he went to Berlin, where Encke, Förster, Dove, and Kummer were his principal teachers. He began by giving special attention to astronomy, and indeed intended to devote himself to that branch of science. While yet undecided, however, he entered the private physical laboratory that Gustav Magnus had fitted out in the Prussian capital, and in which students with a decided taste for experimental investigation were allowed to work. From the beginning he displayed extraordinary experimental ability, combined with rare energy in the pursuit of the work he had once taken in hand, qualities which were characteristic of him during his whole scientific career. He also attended the physical "colloquia" which Magnus had introduced, and under the influence of the latter was definitely enrolled in the lists of experimental physicists.

He graduated at Berlin in April 1864, with an investigation on the depolarisation of light. The first and last of the theses appended to his dissertation (dedicated to Magnus) are characteristic of the state of his mind at that time. They run as follows:—

(1) Vires animæ non minus metiri possumus, quam vires physicas. . . .

(4) Theoriam a Cl. Fresnel de torsione planitiei polarisationis promulgatam si adoptamus, omnia ea corpora quæ planitiem polarisationis torquent, sub aptis conditionibus birefractionem demonstratura esse, negare non possumus.

He never himself followed up the psychological lines of research hinted at in the first thesis; the last proposition is known to be entirely borne out by modern research on circular double refraction.

In 1867 he became "Privatdocent" in the University of Berlin, but was appointed to a professorship in the Swiss federal polytechnic school at Zurich, in the following year. There he remained but two years, removing to Würzburg in 1870, where his stay was of no longer duration, the then newly organised University of Strasburg having called him to represent his science on a brilliant staff of young and enterprising men, who within a few years brought their "alma mater" to a high level of excellence. In this work of organisation Kundt was one of the most actively engaged, holding the office of rector in the year 1877, when but 38 years of age. Quite apart from his purely scientific reputation, this alone is sufficient to mark his name with golden letters in the annals of Strasburg University, for which he also erected an imperishable monument, the Physical Institute, well known throughout the scientific world as one of the best laboratories existing.

In 1888, when Prof. von Helmholtz became president of the "Reichsanstalt," Kundt succeeded him as professor of experimental physics, and director of the Berlin Physical Institute. A prolonged period of scientific activity from a man of but fifty years of age with a world-wide reputation might still have been expected; but these hopes have proved vain. A few years ago the symptoms of a disease began to appear, which could not be subdued. Kundt fought for life to the last; and notwithstanding the slow but unceasing strides his ailment made, which would have entirely prostrated most other men, he continued his lectures and other pressing duties during the whole of last winter, thus setting an example of sacrifice to the cause of science even in the face of death. When, at the urgent instance of his medical advisers and friends, he stopped work and left Berlin, it proved of no avail; in fact, he may be said to have died as he had lived, in the midst of scientific work.

As an investigator Kundt was many-sided; his discoveries are so generally known, that it is hardly necessary to describe them in detail. He first turned his attention to acoustics; his start in scientific life being the invention of the well-known "Kundt's sound tubes," or "Kundt's dust figures," which he himself and others turned to account in many different ways. The application of that purely acoustic method led to the determination of the ratio of specific heats of mercury vapour. In collaboration with Warburg (1884), Kundt found this to be 5/3, as predicted by the kinetic theory for a monatomic gas. He also conducted researches on thermal conductivity and inter-diffusion of gases or vapours and on the influence of pressure on the surface tension of liquids; and developed his well-known red and yellow dust-spray method for investigating the pyro-electric and piezo-electric properties of crystals.

But in glancing over his life-work as it now lies before us, it appears as if the palm ought to be assigned to his optical and magneto-optic discoveries. He began with a brilliant series of papers on anomalous dispersion, which placed this important subject on a sound footing. He described the doubly refractive properties of vibrating solids,

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of metallic films obtained by disintegration of cathodes and of certain liquids in motion, and investigated the optical properties of electrified quartz. With Röntgen he was able to show a slight magneto-optic rotation in several vapours and compressed gases, which even Faraday had not been able to detect, and, on the other hand, its enormous value in iron, cobalt, and nickel. The latter will be known to coming generations as "Kundt's phenomenon." Last, but not least, he succeeded in determining the refractive indices of metals, which he was able to obtain in the shape of extremely thin prisms.

His experimental work, of which the above gives but an incomplete summary, is throughout characterised by the greatest ingenuity in the selection of means to attain definite ends, by the rare quality of ever-watchful self-criticism, which prevented his running away with himself. He possessed that instinctive and immediate power of discriminating the broad way of progress into the unknown from the stray paths leading into tangled wilderness, a faculty which he used to call the pioneering scent of the experimenter.

Space forbids an adequate account of what Kundt personally was to his family, his friends, and his pupils. The latter, a great number of whom are scattered throughout the civilised world, were attached to him by the strongest ties of a scientific and private character, and lost no chance of showing the high esteem they felt for him. They owe a life-long debt of gratitude to the great experimenter, who to most of them was not only a teacher but also a personal friend, ever ready to render help and advice based on his varied experience of scientific life.

H. du Bois.

NOTES.

The annual meeting for the election of Fellows into the Royal Society was held on Thursday last, when the following gentlemen were elected:—Mr. William Bateson, Mr. G. A. Boulenger, Dr. J. R. Bradford, Prof. H. L. Callendar, Prof. W. W. Cheyne, Mr. R. E. Froude, Prof. M. J. M. Hill, Prof. J. V. Jones, Mr. E. H. Love, Mr. Richard Lydekker, Mr. F. C. Penrose, Mr. D. H. Scott, Rev. F. J. Smith, Mr. J. W. Swan, Mr. V. H. Veley.

Prof. Percy Frankland, F.R.S., has been elected to the chair of chemistry and metallurgy in Mason's College, Birmingham, rendered vacant by the resignation of Dr. Tilden.

We regret to announce the death, at the age of sixty-seven, of Prof. W. D. Whitney, well known for his philological researches.

We are requested to state that a British Committee, of which Sir Douglas Galton, K.C.B., F.R.S., is the chairman, and Prof. W. H. Corfield is the treasurer, has been formed to further the interests in this country of the Eighth International Congress of Hygiene and Demography, which is to be held in Budapest, from September 1 to 8 of this year. Any information may be obtained about the Congress from the Hon. Secretary, Dr. Paul F. Moline, 42 Walton Street, Chelsea, S.W.

The University of Halle will celebrate its second centenary on August 2nd, 3rd, and 4th of this year.

Sir Spencer Wells has been elected a Fellow of the Hungarian Academy of Sciences.

M. d'Arsonval has been elected a member of the Section de Médecine et Chirurgie of the Paris Academy of Sciences, in succession to the late Dr. Brown-Sequard.

The death is announced of Dr. E. Sperk, Director of the Imperial Institute of Experimental Medicine, St. Petersburg, and of Prof. Fischer, Chief of the Royal Prussian Geodetic Institute.

Dr. H. Molisch has been appointed Director of the Institute of Vegetable Physiology at Prague, in the place of the late Prof. G. A. Weiss.

M. P. Sinteins has just started on a journey of botanical exploration in Eastern Armenia.

Dr. C. V. Riley has resigned the post of entomologist to the U.S. Department of Agriculture, on account of failing health.

It is reported by the Eastern Extension, Australasia and China Telegraph Company, that a plague has broken out at Hong Kong. No particulars as to the epidemic have been received, but its serious nature may be gathered from the report that fifteen hundred deaths have already occurred, and that this list is increased by nearly one hundred every day. It is said that half the native population, numbering about one hundred thousand, have left the colony, and thousands are following them daily.

A violent hailstorm visited Vienna on Thursday last, shortly before seven o'clock in the morning. The hail was preceded by a heavy fall of rain, and accompanied by slight displays of sheet lightning. In the course of a few minutes the streets were covered with a thickness of several inches of hailstones. It is said that upwards of one hundred thousand windows were smashed by the hail; numerous trees were entirely stripped of their foliage, and most outdoor plants within the area of fall were destroyed. The hailstones were, on the average, about the size of hazel-nuts. During the storm the temperature dropped to 10° Réaumur (54° Fahr.), but shortly afterwards the thermometer rose a few degrees. Similar storms are reported from various districts in Hungary and Croatia.

The New York members of the London Society of Chemical Industry have drawn up a petition requesting permission from the Council to form a local section. This is a step towards the realisation of the scheme suggested by Dr. Armstrong in his recent address to the Chemical Society.

The Iron and Steel Institute has issued its provisional programme for the Brussels meeting, which is to be held August 20 to 24. There will be a reception by the Local Committee on the 20th, reading and discussion of papers on the mornings of 21st and 22nd, a visit to the Antwerp International Exhibition on the afternoon of 21st, a visit to the Mariemont Collieries and Couillet Steel-works at Charleroi on the 23rd, and a visit to the works of the Cockerill Company, at Seraing, and the Angleur Steel-works, at Liège, on the 24th.

In connection with the recent foundation of a Research Fellowship in Chemical Pharmacology by the Court of the Salters' Company, the Research Committee of the Pharmaceutical Society announces that the selection of the Salters' Company's Research Fellow will take place on July 3 next. Written applications for the Fellowship must be received by the Director of the Research Laboratory, 17, Bloomsbury Square, before June 30.

At the meeting of the American Academy, on May 8, the following officers were elected to serve during the coming year: President, Prof. Josiah P. Cooke; Vice-President, Mr. Augustus Lowell; Corresponding Secretary, Prof. Charles L. Jackson; Recording Secretary, Mr. William Watson; Treasurer, Mr. Eliot C. Clarke; Librarian, Mr. Henry W. Haynes; Councillors, Messrs. William R. Livermore, Benjamin O. Peirce, Benjamin A. Gould, Henry P. Walcott, Benjamin L. Robinson, Henry W. Williams, J. R. Thayer, T. W. Higginson, and Andrew M. Davis.

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